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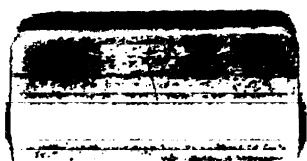
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THE FOOCHOW ARSENAL,  
AND  
ITS RESULTS.

FROM THE COMMENCEMENT IN 1867, TO THE END  
OF THE FOREIGN DIRECTORATE, ON THE  
16TH FEBRUARY, 1874.

BY  
PROSPER GIQUEL,  
*Director.*

---

TRANSLATED FROM THE FRENCH,

BY  
H. LANG.  
(*Reprinted from the "SHANGHAI EVENING COURIER."*)

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SHANGHAI:  
PRINTED AND PUBLISHED AT THE OFFICE OF THE "SHANGHAI EVENING COURIER."  
1874.

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SOUTH PASADENA  
CALIFORNIA

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## PREFACE.

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THE European staff appointed by the Government of China to found the "Arsenal of Foochow," and to carry out the programme of works and of instruction agreed upon, must complete the task at the end of the present Chinese year, 16th February, 1874. By Edicts which will be found further on, His Majesty the Emperor has just declared that the stipulated programme has been carried out to his satisfaction, and has testified, by rewards, to the success of the efforts which have been made from the end of 1867 to the commencement of 1874, that is to say, during more than six years.

We have thought that some information regarding an enterprise which must be considered great in China,—some data as to its actual condition—might present points of interest ; but not having leisure now to attempt a complete and detailed account, (which, however, will be undertaken afterwards), we content ourselves for the present with giving certain documents, and a sketch, in which will be found a *resumé* of the results obtained.

We hope that those who read this *brochure* will be disposed to admit that China possesses, in the Arsenal of Foochow, an important point of departure for the development of her industry, and that she can reap very great advantage from it, if her Government and officials are willing to continue to show the same interest in its progress as they have taken in its foundation.

FOOCHOW, 6th February, 1874.

coal of Formosa was not distant, and that labour could be had at cheap rates. And, finally, as a crowning reason, the work would be under the supervision of the high Chinese official, the originator of the scheme, who was then at Foochow, occupying the position of Viceroy of Fohkien and Chekiang.

*The Viceroy Tso.*—This high mandarin is named Tso-Tsong-Tang, and there is reason to hope that he will receive the place he deserves in the history of China, if the Arsenal prove to be the point of departure on a course of industrial enterprise to which the Empire had previously been almost entirely closed. To establish an Arsenal such as that at Foochow, would be, in Europe or America, a very ordinary affair. But in China its promoter ran great risk; for, according to the system followed by the Government at Peking, which never takes the initiative in any new undertaking, but contents itself with vetoing or sanctioning what is proposed to it, the Viceroy Tso had to assume the entire responsibility of his project, and a failure of his experiment would have ruined one of the most successful careers that the mandarinat could present.

*Negotiations relating to the establishment of the Arsenal.*—M. Giquel had made the acquaintance of this mandarin when, in command, during the Rebellion, of a Franco-Chinese Corps, organised by one of his colleagues and himself, he operated in the province of Chekiang in concert with the troops which this dignitary had under his command. The campaign being brought to a close at the end of the year 1864, the Viceroy asked that officer for the plan of a Naval Arsenal; but that which was submitted to him was not able to be definitively sanctioned till the end of 1866, for up to that time Tso was engaged in pacifying the other districts which the Rebellion still devastated.

It was at this latter date that the contracts were signed which were to bind M. Giquel and his staff to the Chinese Government.

*Fundamental Programme.*—The programme resolved upon was as follows:—

- 1.—The establishment of workshops and building yards suitable for the construction of ships and their engines and appliances.
- 2.—The establishment of schools designed for the training of foremen for the construction, and of captains and engineers for the working, of the ships and machinery.
- 3.—The engagement of a European staff competent to carry on the works, and to teach the Chinese workmen, foremen, and cadets.
- 4.—To provide a Patent Slip, on Labat's transverse system, similar to that in use at Bordeaux, for the repair of ships.
- 5.—The organisation of a metal-working forge, capable of rolling into bars and plates the masses of rough iron which the province supplies, and the old scrap iron which could be procured in China.

*Commencement of the Works.*—At the beginning of the year 1867, some preparatory works, such as building quarters for the employés and storehouses, &c., were put in train, but it was scarcely until the month of October of the same year, on the return of M. Giquel from a voyage which he had made to Europe, to collect the necessary materials and staff, that the works of the Arsenal, properly so-called, received their real inception. The Foreign residents of Foochow still remember the impressions of surprise and doubt which

they experienced when they saw that naked rice-field on which it was necessary that the workshops should be erected. Of the plant purchased in France, nothing at all had yet come to hand, and the starters of the enterprise found themselves in a port which offered no resources—such as European machines and tools. It was necessary, notwithstanding, to set to work; a little square cottage, the only one that was found on the ground, served as a workshop for the forges; two fires were at once built in it, and set to work by means of a Chinese bellows, and here the first nails were made. With native carpenters, pile-drivers were constructed to drive home the piles, and from that the next step was to start a building-yard, in which, three months afterwards, the Director laid down, with due solemnity, the keel of a transport. All this while the filling in of the ground was vigorously pushed on, with 1,200 men; for it was necessary to raise the ground five feet, in order to place it above the highest floods; and, as it was necessary to soothe the very natural impatience of the Chinese, who demanded to see results with the least possible delay, there was undertaken the construction of a series of wooden workshops, in which were placed a portion of the machine-tools from time to time, as they arrived from Europe. These improvised workshops still exist, and the Arsenal presents the spectacle common enough in the new creations made by the foreigner, of buildings erected in haste side by side with permanent establishments erected with a downright profusion of materials and labour.

#### WORKSHOPS AND BUILDING-YARDS.

The following is a brief description of the Workshops and Building-yards of the Arsenal:—

*The Metal-working Factory*, where are found the buildings occupied by heavy forges and rolling mills, occupies a space of 4,190 square metres.\* The heavy forges are provided with six hammers; one hammer with a simple action of 7,000 † kilogrammes constructed at the Arsenal; one Farcot-hammer with a double-action of 6,000 kilogrammes; one hammer with a simple action of 2,000 kilogrammes; one with a simple action of 1,000, and two hammers of 300 kilogrammes; with 16 forge fires for heavy work and six furnaces for re-heating. This workshop has already turned out the forged parts of marine-engines of 150 horse-power, included in which are straight shafts and crank shafts. It has in like manner fabricated the strong forge pieces needed for the armament of the Arsenal ships, such as cat-head anchors, weighing 1,300 kilogrammes and under ships' anchors, &c., &c.

*The Rolling Mill* contains six furnaces for reheating, and four rollers; one for the plates; one for heavy iron and angle-iron; one for small ironwork; the fourth for copper, work;—they are worked by a hundred horse-power engine. Bars there are rolled having a thickness of 15 millimetres and under; iron in square and round bars having from 6 to 120 millimetres in diameter, or on the square; copper in bars from 7 to 30 millimetres in side or diameter; and, in fine, copper for the sheathing of ships. It would be able by working day and night, as is done in foreign factories, to turn out 3,000 tons per year of rolled iron.

*The Boiler-shop* occupies a space of 2,400 square metres. It consists of a central

\* 1 square metre is equivalent to 1 yard 196-1000ths.

† Expressed in English notation, the force of that tool is 138 cwt.

hall of 20 metres wide and of two wings of 10 metres each. One of these compartments serves as the *Copper Boiler-shop*. An engine of 15 H. P. supplies a blast to the forges, and movement to the machines of these two workshops. In addition to the ordinary work of the Arsenal, to the fitting up of the boilers arrived from Europe, and to the fitting up of the ships, this workshop has put together 14 main boilers, with 4 and 5 fire-boxes prepared for the construction of 7 evaporating apparatuses for engines of 150 H. P., with their tubing.

The *Fitting-shop* consists of two sections, which together cover, in like manner, 2,400 square metres; only one of them has been made use of as yet, the other is being gradually furnished with machines. This workshop, which is devoted to the construction of engines for the ships of the Arsenal, could in its present condition turn out 500 H. P. per year. It makes use of a force of 30 H. P. It has built and turned out 7 marine engines of 150 H. P.; two others are well advanced.

The *Setting-up Shop*, which is between the two sections of the fitting-shop, covers a surface of 800 square metres; over it there is a floor on which are situated the offices of the engineer and those of design.

The *Foundry* occupies a surface of 2,400 square metres; it is composed, like the boiler shop, of a central hall of 20 metres capacity, and of two wings of 10 metres each. It is worked by an engine of 15 H. P. Without taking into account the materiel of the *Brass Foundry*, it has three cupolas, enabling it to melt masses of 15 tons; it has turned out on an average from 12 to 15 tons of castings per week, and, among these, parts of the 150 H. P. engines, such as cylinders, condensers, &c. As a matter of fact, its production has even reached the figure of 90 tons of castings per month.

The four workshops just mentioned have been built with superb materials. The Chinese have supplied excellent bricks made at the neighbouring port of Amoy; the foundations have been built of fine stones, which were easily found in the hills close to the Arsenal. The bracings of the ridges of those workshops, the central halls of which are not less than 20 metres wide, have been made of a single piece, from beams 22 metres long, of that building timber found at Singapore, the hardness of which defies the gnawing of the white ants, and, one might almost say, the tooth of time. Finally, the Arsenal has cast 120 columns, of 2,500 kilogrammes each, to support these timber works.

*Wooden Buildings* :—The *Chronometer-shop* covers a surface of 720 square metres. It is divided into three sections;—one intended for the making of chronometers, the other for that of optical instruments, the third for ships' compasses.

The *Small Forges* designed to supply the innumerable smaller articles used in the construction and equipment of a ship, occupy a superficies of 2,160 square metres; they include 44 forges and three hammers of 300 kilogrammes. Beside them, a workshop for *Small Fittings* and for *Locksmith work*, is used in like manner in the equipment and in the construction of ships; it covers a surface of 510 square metres.

Further on is found the workshop of a *mechanical sawmill*, of a superficies of 1,020 square metres; alongside of it, the *model room* and the *joiner's shop* covers a surface of 1,440 square metres. The latter has supplied models for three engines of 150 H.P., for an engine of 250 H. P., for a hammer of 7,000 kilogrammes; without counting

the numerous different models of fittings and of tools required for the workshops and for the equipment of ships.

The *Building Yards* are composed of three sets of stocks. On the right and left of each of these are found workshops for the employés. An immense shed serves as a moulding hall, on which can be traced out in full size the lines of the ships. A *Musting Engine*, capable of lifting weights of 40 tons, and a *Patent Slip* on Labat's (of Bordeaux) system, complete the programme required for a ship-building establishment ; this latter is able to receive ships of 100 metres of keel, and of 2,500 tons' displacement : in it ships are drawn up sideways, and by this means avoid the inconveniences attaching to *Slips* placed longitudinally.

The *Store-houses* are divided into two classes ; some, under the immediate supervision of the Chinese, receive articles of all kinds intended for the general supply of the Arsenal. These articles go from there into a general store, and are afterwards delivered out to the workshops, according to their requirements.

Finally, outside the Arsenal, there has been established a *Brick-field*, which supplies ordinary bricks and fire bricks. Near it are kilns for the preparation of lime.

The *Quarters* of the European staff and of the Chinese employés, as well as the schools, are all situated outside of the enclosing moat which surrounds the Arsenal properly so called and completely isolates it. At night, the gates of the bridges are closed, and there remain only the Chinese soldiers placed on guard over it.

The total extent of the grounds of the Arsenal is 47 hectares 77 ares\* a portion of which, amounting to 18 hectares 8 ares, is covered by the workshops, store-houses, coal-yard, &c. The surface occupied by covered buildings of this last kind is 4 hectares 30 ares.

The portion devoted to the Yamen, to the European and Chinese residences, to the camp of troops who keep guard over the Arsenal, to the buildings for religious service, &c., extends to 6 hectares 84 ares, of which the surface covered by buildings amounts to 3½ hectares.

*Ships Built.*—Up to the present time the Arsenal has turned out 15 steamships-of-war ;—a corvette of 250 H.-P., capable of working up to 450 H.-P. (of 250 kilogrammetres) ; 9 transports each of 150 H.-P. ; 3 despatch gun-boats of 80 H.-P., capable of working up to 140 H.-P. (of 250 kilogrammetres), and 2 gunboats of 80 H.-P., capable of working up to 130 H.-P. (of 250 kilogrammetres). The details of these will be found in a note attached to the present notice.

*Schools.*—A report annexed below, and addressed by M. Giquel to H. E. Shen, gives all the details relative to the Schools of the Arsenal, and to the results which they have secured.

*Administration and Direction.*—The administration of the Arsenal is of a mixed character. The Chinese are entrusted with the enforcement of discipline, the payment of their men, and, in the workshops, with the control of the materials which go in and come out : the direction of the works and of the instruction belongs to the Europeans. The Director has reason to congratulate himself on having given up to the Chinese a wide range in the working of the undertaking ; their self-esteem has thus found a stimulus which has secured for him, on their part, the most valuable assistance. As

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\* The hectare represents 2.47 acres English measure.



the Viceroy Tso had to leave Foochow for another appointment when the Arsenal was scarcely sketched out, the Chinese Government delegated, for the continuance of the work, an Imperial Commissioner, with the rank of Governor of a province. This mandarin is named Shen, and was formerly Governor of Kiangsi. This man is remarkable for his energy, his strength of will and the authority with which he is able to make himself obeyed. He is a member of a high Committee of Supervision, consisting of the Viceroy resident at Foochow, the Governor of the province, and the Marshal Commanding-in-Chief the Tartar troops. He has attached to himself a Consulting Committee of high mandarins. One hundred subordinate mandarins and gentry of the district are entrusted, under his direction, with the special duty of keeping the accounts, maintaining discipline and exercising the control which falls to the Chinese.

The European direction is in the hands of a single French Director, seconded by the entire staff of the different departments. There were at first two Directors, a first and a second, who together attended to the conception and foundation of the Arsenal; but for reasons which it is unnecessary to enumerate here, the second Director soon requested to be detached to another service independent of the works of the Arsenal, in which he has remained since then, and he was replaced by a sub-Director.

*The Employés.*—The Chinese staff is composed of 500 workers in wood,—carpenters, cabinet-makers, modelers—paid on an average 300 to 400 cash per day; and of 600 workers in iron, who receive in like manner the same pay per day. In each of these two categories there are foremen, who are paid \$40 to \$50 per month. The *personnel* comprises also 130 apprentices, who are paid at present 300 cash per day; 300 pupils in the Schools, 500 labourers, 500 soldiers employed in guarding the Arsenal, and also in service at earthworks and portorage; finally, 130 persons on the staff of the Mandarins and of overseers of all sorts. Altogether, they amount to 2,600 men.

The European employés, including both those of the offices and of the workshops, amounted at first to 75 persons, but of these there remain only 52, or, including wives and children, 66. This staff comprises: a director and sub-director; an engineer, professors, secretaries, interpreters, foremen, workmen, and supernumeraries. The workmen are paid \$100 per month; the foremen double that amount.

*Difficulties Overcome.*—The above-mentioned results have not been achieved without encountering difficulties of more than one kind. As to practical difficulties; it was necessary to select an alluvial site composed of a thick bed of solidified mud, covering beds of almost liquid clay, and little adapted, in consequence, for buildings. These had all to be laid on piles, planted closely together; of which the Arsenal made use of nearly 5,000. It was necessary also, as has been said above, to raise by a height of 5 feet the rice-field which served as a site for the establishment. The great floods of the river coming to undermine these imperfectly solidified beds of new made land, which there had not yet been time to secure with quays, carried off the embankment in pieces of 100 metres, so that the construction of a small breastwork was necessary to protect the bank. But various advantages of situation, the near neighbourhood of the city, and the facility of communicating with the ships, determined the Director to fix on that spot, in spite of the inconveniences just mentioned. It must also be considered that a commencement had to be made at a port where naval construction was quite unknown, and that it was necessary, consequently, to set workmen to work who were

altogether ignorant of what they were about to be taught, and whose language the European staff did not understand.

As may well be supposed, moral difficulties were not less urgent. It was, in fact, to be foreseen that in a staff of more than 80 persons newly arrived from Europe, there would be some who would refuse to act in harmony with a race considered by them to be their inferiors, and that that would be a source of embarrassments. An undertaking which makes its first commencement has always at its side, and especially in a foreign country, where rascalities are less easily detected, parasites who wish to eat it up, and malicious persons who seek to ruin it. But, although such experiences may not have been spared it, the Arsenal of Foochow has triumphantly resisted them, and its staff has been able to finish to a point the task which was confided to it.

*Expiration of the Contracts of the European Staff.*—The duration of the contracts of the European employes was fixed at five years, to date from the day when the engine workshops began work. It was found that the said term of 5 years commenced on the 12th of February, 1869; therefore the mission of these employes will be terminated on the 12th February next. The results obtained,—the good understanding which has not ceased to prevail between the Europeans and the Chinese, allows it to be believed that this country will preserve a kindly remembrance of the foreigners who came, at its request, to establish the Arsenal of Foochow.

#### LIST OF THE SHIPS BUILT AT THE ARSENAL OF FOOCHOW.

Official Number	DATE OF LAUNCH.	NAMES OF THE SHIPS.	CLASSES.	DIS'MENT IN TONS OF 1000 KILOGRMS.	H.-P. No.	GUNS.	MEN.
1	June 10, 1869 .....	<i>Ouan-Nien-Tsing</i> .....	Transport .....	1450.	150	6	100
2	Dec. 6, 1869 .....	<i>Mei-Yune</i> .....	Gunboat .....	515. <sup>100</sup> / <sub>1000</sub>	80	3	70
3	May 30, 1870 .....	<i>Fou-Sing</i> .....	do. ....	515. <sup>100</sup> / <sub>1000</sub>	80	3	70
4	Dec. 22, 1870 .....	<i>Fou-Po</i> .....	Transport .....	1258. <sup>740</sup> / <sub>1000</sub>	150	5	100
5	June 18, 1871 .....	<i>Ngan-Lan</i> .....	do. ....	1005. <sup>403</sup> / <sub>1000</sub>	150	5	100
6	Nov. 23, 1871 .....	<i>Tchuen-Hae</i> .....	G.-B. despatch	572. <sup>594</sup> / <sub>1000</sub>	80	6	70
7	Apr. 23, 1872 .....	<i>Yang-On</i> .....	Corvette .....	1393. <sup>39</sup> / <sub>1000</sub>	250	13	200
8	June 3, 1872 .....	<i>Fei-Yune</i> .....	Transport .....	1258. <sup>740</sup> / <sub>1000</sub>	150	5	100
9	Aug. 21, 1872 .....	<i>Tsing-Yuan</i> .....	G.-B. despatch	572. <sup>594</sup> / <sub>1000</sub>	80	6	70
10	Dec. 11, 1872 .....	<i>Tchuen-Ouei</i> .....	do. ....	572. <sup>594</sup> / <sub>1000</sub>	80	6	70
11	Jan. 2, 1873 .....	<i>Tsi-Ngan</i> .....	Transport .....	1258. <sup>740</sup> / <sub>1000</sub>	150	5	100
12	Aug. 10, 1873 .....	<i>Yong-Pao</i> .....	do. ....	1391. <sup>662</sup> / <sub>1000</sub>	150	3	100
13	Nov. 8, 1873 .....	<i>Hae-King</i> .....	do. ....	1391. <sup>662</sup> / <sub>1000</sub>	150	3	100
14	end of Dec., 1873...	<i>No. 14</i> .....	do. ....	1391. <sup>662</sup> / <sub>1000</sub>	150	3	100
15	end of Feb., 1874...	<i>No. 15</i> .....	do. ....	1391. <sup>662</sup> / <sub>1000</sub>	150	3	100

NOTE.—Besides the construction and equipment of the 15 ships above-mentioned, the Arsenal has had also to provide for the maintenance and repairs of the training ship *Kien-Wei*, and of the steam-boats *Hae-Tong-Yune*, *Tchang-Sheng*, *Hwa-Fou-Pav*, &c., attached to the Arsenal.

FOOCHOW ARSENAL, 1st December, 1873.

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P.S.—Since the printing of this list, the ship No. 14, has been launched, on the 6th January, 1874, and bears the name of *Tchen-Hang*.

# REPORT.

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*Addressed by M. PROSPER GIQUEL, Director of the Arsenal of Foochow, to H. E. SHEW, Imperial Commissioner and Director-general, on the results of the instruction, theoretical and practical, given to the Chinese employés by the European employés.*

FOOCHOW ARSENAL, 18th Nov., 1873.

The contract of engagement which served as a basis for the establishment of the Arsenal, defined by the following clause the most important part of the responsibility of the Directors :—" We will guarantee that five years after the workshops of the engines "shall have commenced to work, the engineers and workmen whom we shall employ "will have taught the Chinese officers and workmen to build a ship according to a given "plan, and to make machine-tools with the machines placed in the workshops. We "will also open a French school, the pupils of which shall learn that language, and "enough of mathematics to construct a ship on a given plan ; besides, an English school, "the pupils of which shall learn that language, and shall prosecute the studies essential "to the commanding of the ships. This task we undertake on our own guarantee and "with the most perfect good-faith."

At the time when that contract was signed, that is to say, in the month of December, 1866, there were two of us to share in the responsibility stipulated above ; but in the month of July, 1863, M. d'Aiguebelle, at his own request, was permitted by Your Excellency to be completely detached from the Arsenal to engage in another service, and left to me to carry out alone the programme which had been entrusted to us. Thus it happens that I come alone to present to Your Excellency a report of the results which the Arsenal has derived from the instruction given to the Chinese pupils and workmen by the European staff placed under my direction.

## FRENCH SCHOOLS.

The French schools are three in number ; the School of Naval Construction, the School of Design, and the School for Apprentices. There has been, besides, in each of the workshops special instruction given to the more intelligent workmen, so as to put it in their power to fulfill the conditions of the contract, that is to say, to understand the plans of an engine or of a hull, and to execute the work of them.

I shall proceed to pass in review the different schools and workshop instructions above mentioned, to point out the special object of each, and to indicate the results obtained.

*The School of Naval Construction.*—The school of naval construction was organised in the month of February, 1867 ; it then contained twelve pupils, placed at first under the direction of M. A. Borel, the Secretary of the Directorate. In the month of April, 1868, it passed from the hands of M. A. Borel into those of M. M. L. Rousset, professor of Physics and Chemistry, and L. Médard, professor of Mathematics. It then counted 26 pupils, divided into three sections. At the present time it numbers 38, divided into four sections, besides a pupil unconnected with the ordinary course.

The object sought in this school has been to put it in the power of the pupils to explain to themselves, by the help of reasoning and calculation, the function, the dimensions, and the part played by the different parts of an engine, in such a way as to be able to design and reproduce one of its detached members; and in regard to hulls, to calculate, to design, and to trace in the moulding hall, the hull of a wooden ship, not differing much as regards size from those which the Arsenal had to build. This course of study was amply sufficient to occupy them up to the limit of time fixed by our contract, as it is easy for me to demonstrate. Thus, in order to calculate the dimensions of a piece of machinery or of a hull, it is necessary to know arithmetic and geometry; in order to reproduce that object on a plan it is necessary to understand the science of perspective, which is descriptive geometry; in order to explain the pressure exerted on engines and ships as well as on all bodies, by gravity, heat, and other phenomena of nature, it is necessary to understand the laws of physics. Next in order come the movements a body undergoes under the impulse of the forces to which it is subjected; the resistances which it will need to overcome, the strain which it is able or ought to bear, which is the science of statics and of mechanics; and for these the calculations of ordinary arithmetic and geometry no longer suffice; it is necessary also to possess the knowledge of trigonometry, of analytical geometry, of the infinitesimal calculus, so as not to be any longer bound down to reason as to objects of determinate form and size, but be able to arrive at general formulæ applicable to all the details of construction. The preliminary studies were complicated in the case of the pupils of our schools, by the learning of the French language, of the first word of which they were ignorant when they were handed over to us. Finally, in order to enable them to apply to the works executed at the Arsenal the theoretical ideas acquired by them, a practical course of construction of engines was given them by the Engineer, M. E. Jouvét, and a course of construction of hulls by the Foreman, M. F. Marzin, under the direction of M. M. Robin, master carpenter. Each of them has been attached to some manual work for some hours of each day during the past two years of the school's existence, in order to familiarise himself with the work of the shops, and thus become capable, by and by, of directing the workmen.

The first and the second division of the school of Naval Construction have alone had the time to go through the whole of this programme. Their scientific course comprises: arithmetic, elementary algebra, elementary geometry, descriptive geometry, physics, trigonometry, ideas of analytical geometry and of the infinitesimal calculus, and mechanics. Their practical studies, which at the end of this Chinese year will have lasted only fourteen months, have embraced the transmission of applied impulse in the workshops by the driving engines to the machine-tools; and the resistance of the shafts, of the pulleys and of the tooth and pinion wheels which act as the vehicles of its transmission, as also of the driving belts. As to the engines, a very detailed description of the boilers and of their motive apparatus has been given them; there has also been demonstrated to them the use of the formulæ enabling them to calculate the different factors of power in the steam-engines employed in the workshops or placed on board the ships built at the Arsenal. To those who are specially intended for the building of engines, the Foreman, M. Dessaut, has taught the operations essential to the regulation of a steam-engine, that is to say, the way to determine the respective positions of the piston-rod

which moves the crank-shafts, and the eccentrics which set in motion the valves for the distribution of steam. They have, in like manner, learned the operations for the regulation of the admission of the steam into the cylinders, and its discharge into the condenser. Without an exact performance of these operations, it becomes impossible to secure the regular working of an engine.

These antecedent studies form the first degree of the science of the engineer; they are sufficient for the manager of a workshop. An Engineer ought, besides, to be able to form a complete model of an engine, to organise a factory, &c. In order that the pupils might be able to reach that stage, it would be necessary for them further to have engaged in a comparative study of a number of styles of workshops and of engines; to have reproduced many of those styles by drawings; finally, to be initiated by practical work in the fabrication of engines of all sorts and sizes. We have had neither the time nor the means to push the pupils so far; indeed, China does not offer at the present time a field of industrial manufacture sufficient for the forming of engineers; it would be necessary for them to go to Europe to acquire the experience which time and the study of various models alone affords, and the time which would be necessary for their instruction would be four years at least. The Chinese Government will see afterwards whether it wishes to use to advantage the abilities of its pupils by employing them in the workshops of the Arsenal, or by causing them to continue their studies in order to secure for itself engineers who would not only be able to direct their constructions, but would supply them with plans and designs for new constructions, by taking advantage of the most recent industrial improvements.

The two divisions now under notice consist of fourteen pupils; six of these have been attached to the Fitting-shop, after having passed several months in the designing office. These are *Tchen-tcheng*, *Tchen-tsing-hien*, *Tchen-tchao-ngao*, *Ou-ang-kiao-nien*, *Liang-ping-nien*, *Lin-tcheng-chang*. The Fitting-shop being that in which all the different parts of an engine come to be put together, it was there that the pupils were able most advantageously to carry out the course of their practical education; they were there very specially pushed on in the regulating operations mentioned above. I submit to Your Excellency designs made by them for the regulation of the engines built at this Arsenal.

A pupil, *Ouei-tsae*, has pursued with success the course of instruction given by M. Jouvett, but being of too weak a constitution to be put to work in the workshops, he has been fixed upon as a tutor for the less advanced pupils. Another, *Lin-tsou-sin*, has been set apart for the Chronometer-shop, where he renders good service.

Finally, six pupils have been detailed to the carpenters' workshop, namely, *Ouei-han*, *Kou-chen-teh*, *Tchen-ping-kouo*, *Lo-tchen-lo*, *Ou-teh-chang*, and *Yio-sio-che*. With them, three pupils of the fourth division have been attached to this course; namely, *Lin-ming-sün*, *Tseng-tsong-ying*, and *Yang-fong-yi*. Specially devoted to the construction of hulls and the equipment of ships, they have learned to determine by calculation what shape ought to be given to the hull of a ship, so that she may have the dimensions, the draught of water, and the carrying capacity which would be indicated to them; their instruction has extended only to wooden vessels, the only kind turned out at the Arsenal. They know what scantling must be given to the wood of a timber in order that it may have the requisite strength; they know also what extent of sail-spread a ship ought to have,

in order to steer and manœuvre with facility. After having thus made the plan of a ship, and calculated all its constituent parts, they are able to trace it out in its full size in the moulding hall ; leaving to the workmen only to lay down on that tracing the patterns or moulds which are to guide them in their work. In order to apply their knowledge to the ships built at the Arsenal, I have caused them to make the plans and specifications of a transport of the style of the *Anlan*. I have the honour to submit these to Your Excellency.

The pupils of the third division number four, and have had on an average only sixty-three months' attendance at the school. They have attended the same theoretical studies as their comrades, but without understanding them so thoroughly. There has not been sufficient time to give them the same course of practical instructions ; they have, however, gone through a very detailed course of study, descriptive of engines and of boilers, which enables them to understand thoroughly the working of all the parts of an engine ; and as they have remained some months' in the designing office, they are capable of understanding plans and of explaining them to the workmen placed under their direction. Three of them have been attached to the pattern-shop for about nine months, the fourth has been for about twenty-nine months in the Fitting-shop.

The fourth division is composed of twenty pupils, of whom ten have had an average of sixty-three months' attendance at school, but they have not had the intelligence necessary to advance as rapidly in their studies as those of the third division ; the ten others belonged to the School of Design, of which they formed the first division. In the month of April, 1871, I caused them to enter the School of Naval Construction, in order to raise the standard of their instruction. The studies pursued by the fourth division comprise arithmetic, algebra, geometry, descriptive geometry and physics. They have, besides, learned design, and followed the same course descriptive of the steam engine as the pupils of the third division. I have already said that three of them have been put into the carpenters' shop ; two others, *Tchang-king-cheng* and *Tcheng-kong-kouei*, have been sent to the pattern-shop. After fifty-seven months' attendance in that shop, their progress has been sufficiently marked to permit the direction of it to be entrusted to them. Five remain in the school of design, where they have acquired a real superiority in the art of making a specification of an engine, and of reproducing the parts of it with sufficient exactness to admit of their constructing them, and to draw a working plan from a rough sketch by the engineer.

Your Excellency will find annexed to this Report, a list giving the names of the pupils in the School of Naval Construction, and notes on the theoretical and practical abilities of each. The difficulty which their professors have had to overcome in bringing them to the stage of advancement at which they have arrived, may be judged of by the fact that out of one hundred and five pupils who entered the school only thirty-nine remain ; six are dead ; the other sixty have had to be sent away, after a course more or less prolonged, as incapable of following out the courses of study.

If the Chinese Government wished to derive immediate advantage from the acquirements of the pupils, it would be necessary to classify them according to the list appended to this Report :—

*Tchen-tcheng* would be superintendent of the building of engines, and would be in charge of the office of plans, from which he would distribute the working orders and the plans to the engine shops. He would be assisted by *Leang-ping-nien* and four pupils of the fourth division.

*Tchen-tsing-lien* would be in charge of the fitting and setting-up: he would have under his orders *Lin-tcheng-tchang* and three pupils of the last two divisions.

*Tchen-tchao-ngao* and *Ouang-kiao-nien* would be in charge of the foundry and boiler shops. They would have to assist them five pupils of the last two divisions.

At the Carpentry, *Ouei-han* would be in charge as chief director of the construction of the hulls and the equipment of the ships; two pupils, *Lo-tchen-lo* and *Yio-sio-che*, would be associated with him.

*Kou-chen-teh*, seconded by *Ou-teh-chang* and *Yang-fong-yi*; and *Lin-ming-sin*, seconded by *Tchen-ping-ko* and *Tchen-song-ying*, would be in charge of the building yards and workshops attached to the carpentry, such as the cabinet-makers' shop, the small forges, the fitting of the equipment, and the compass-making.

*Lin-tsou-sin* would be entrusted with the direction of the Chronometer workshop.

*Ouei-tsae* would be able to continue the studies of the third and fourth divisions. The other pupils, who are not included in this list of classification, would continue to work in their respective shops. They would occupy positions of superintendence when vacancies occurred,

#### SCHOOL AND OFFICE OF DESIGN.

The School of Design has naturally had for its object to organize a staff qualified to turn out the plans needed for construction. It is directed by the foreman, M. A. Louis, assisted by the draughtsman, Kerdraon.

In every industrial establishment the designing office is of great importance. Your Excellency has had an opportunity of noticing the considerable number of plans which that of the Arsenal has had to furnish. I have already said that the pupils of the first division had been handed over to the School of Naval Construction; those of the second division are eleven in number; those of the third number, in like manner, eleven.

The studies prosecuted by these two divisions have been arithmetic, geometry, descriptive geometry, and a very complete course descriptive of a marine engine of 150 horse-power. The pupils have been called on to reproduce in working plans all the parts of that engine. They are capable of making a specification of every engine for the plans of which they have been asked; for eight months they have passed some hours daily in the workshops to acquire a certain acquaintance with the manual labour, and to examine closely the details of the engines and of the tools. The study of French has naturally preceded the courses of study mentioned above, which have been sufficient to occupy the time which the pupils had to devote to them, which has only been one hour and a half in the evening and one hour in the morning. Annexed I present to Your Excellency a list of their names with notes on the progress of each of them. By prosecuting in Europe the education of the most advanced, the point would be reached of making them capable of calculating and of designing all the various parts of an engine, in such a way as to leave to the labour of the engineer only the general conception of a



plan. Such are the acquirements that are demanded in industrial pursuits in the heads of offices of design. If he has not around him a staff of this kind, an engineer can advance in his work only slowly, for he is obliged to do everything himself. But there is required in those who assist him not only the requisite theoretical knowledge, but, in addition, an experience acquired by the study of many engines and of many works. It is only in Europe or in America that the pupils whom I have pointed out could acquire the experience of which they would have need.

#### THE SCHOOLS OF APPRENTICES.

The object sought in the establishment of the Schools of Apprentices, has been to give the young people of whom it is composed the ability to read a plan, to design it, to calculate the bulks and weights of the parts of engines, or of hulls, of whatever form, while at the same time causing them to acquire in the workshops the ability requisite for the work of their profession. They have been at the school only an hour and a half in the evening, generally from 7.30 to 9 o'clock, and from the month of December, 1868, an hour and a half in the morning. The studies they have pursued are: arithmetic, geometry, descriptive geometry, algebra, design, and a course descriptive of engines. Up to the month of November, 1870, the apprentices remained divided, with reference to the schools, according to their workshops, during which time they were pushed on in the study of French, which was necessary to enable them to understand the lessons which were to be given them afterwards. In March, May, and September, 1871, they were classified into four divisions: The first, containing twenty-one pupils, and the professors of which are M.M. Guerin, T. Piry and A. Latouche; the second, of nineteen pupils, whose professors are M.M. Guerin, Marzin, T. Piry and Rivasseau; the third, of nineteen pupils, with M.M. A. Latouche and Cabouret as professors; the fourth, of seventeen pupils, with M.M. Cabouret, Roberdeau, and C. Serreau as professors. I point out specially to Your Excellency the services rendered by M.M. Guerin, Marzin, Latouche and Piry.

The pupils of the first two divisions have reached almost the same point; they can be asked to make a specification of the designs of an engine, to calculate the masses and weight of each of the parts; they are able, further, to describe the working of it in its most minute details. I have caused them to undergo on this point a minute questioning, when I have inspected the staff of the workshops. As to practical ability, there are some of them who, already far advanced in the school, have made surprising progress. I would not have hesitated to propose their appointment as foremen, if they were not too young to assume so soon the responsibility of an important work, and if they were not also wanting in the experience which can be acquired only after having seen many objects and a variety of objects. Among these, I shall point out to Your Excellency the following:—*Tcheou-ying-hsien, Lu-tchang-yuan, Ko-fong-ying, Tchen-hen-king, Lin-peh-hsün, Tchen-tcheng-tcheou, Leou-mo-hsün, Kiou-koou-ngc.* *Tchen-kun-yuan, Tchen-che-hsieou, Jen-sin-ki, Ko-jouei-kouei, Tchen-ko-houei.* By going on to cause to work in Europe for three or four years those whom I have pointed out in the list annexed to this report, there would be produced among them, not only foremen, that is to say, men able to work according to a plan and nothing more, but superintendents of workshops, that is to say, men able to calculate dynamically each part of the engines of their work-

shops, and of such engines as might be given them to build ; men not able to make the plan of a complete engine or of a complete industrial establishment, but capable of supplementing such a plan where any defect might occur in the course of constructing an engine, capable also of organising their workshop in all its departments. Your Excellency clearly saw what assistance I obtained among the superintendents of workshops of the European staff of the Arsenal, when, in consequence of the departure of M. Trasbot, the engineer, I was forced to rely on their knowledge to organise the workshops of the Arsenal. Thanks to them, the work was not stopped for a single instant.

The first two divisions alone have followed out in their entirety the studies which I have described above. And here I desire to offer a tribute of praise to the good will of which the apprentices have given evidence, in working diligently at studies which, after a day laboriously passed in the workshops, occupied an hour and a half of their rest at night. The third division has not had time to prosecute the study of algebra, which, on the other hand, it was not indispensable to overtake within the scope of the contract. The fourth division is composed of all the pupils who arrived later than the others, or who were not sufficiently intelligent to follow the studies of the higher divisions. It was impossible in these circumstances to accomplish much with them; the little of mathematics and design which they have learned will nevertheless be very useful to them in the labours in their workshops.

#### WORKSHOPS AND DOCKYARDS.

The workshops and dockyards are, with reference to the work there carried on, under the immediate orders of M. E. Jouvét, the engineer. I have said above that special instruction was there given to the more advanced workmen and to the apprentices, so as to qualify them to fulfill the conditions of the contract, that is to say, to read a plan and to execute it.

These courses of instruction have, naturally, not gone beyond a simple description of the engines, and the working of their several mechanisms, besides the special details given to the workmen as to the operations of their respective departments. Further than that they could not extend, the workmen to whom they were given not having any scientific knowledge which admitted of imparting to them ideas as to the theory of construction. Their object was to make, of those who prosecuted them, foremen and head-workmen, that is to say, people not having the ideas requisite to draw a plan, or even to calculate, from a dynamical point of view, any mechanism of an engine, but simply to receive a plan containing all the necessary details, and to carry it into practice, or to superintend the execution of it. In order to assure myself as to the results obtained, and to lay them before Your Excellency, and also to organise the native staff of the workshops in such a way as to set them to work some months before the expiration of the contract, without the assistance of the European staff, I instituted searching examinations, in concert with the Chinese officers appointed by Your Excellency, among the workmen and apprentices whom the foremen pointed out to me as fulfilling the required conditions ; and I now proceed to give you the result of these examinations, workshop by workshop.

*Patterns.*—The first workshop examined was that of the patterns, of which M Guerin is foreman, and has under his orders the workmen Pons and Muller.

The workmen whose names are contained in the annexed list, have been called on to read all the plans of a marine engine of 150 H.P. ; to explain in detail the working of all its parts, and to give answers regarding the technical difficulties of their profession. Thus, the question has been put to them : By how much it was necessary to increase the dimensions of the faces of a model in order to make allowance for the shrinking of cast iron, and to leave enough of surplus material for the work of planing ? In what manner the patterns ought to be made, and the moulding boxes (or *cores*) arranged, in order to render possible or easier the operations of the foundry. At the end of that examination I sent to Your Excellency a classification of the sections of that workshop, and I proposed to cause it to execute without the help of Europeans all the patterns of an engine of 150 H.P. That work was commenced at the beginning of July, 1873 ; the superintending Europeans have not since that time set foot in the workshop, and as the patterns in question are almost finished, Your Excellency has the means of judging whether the workmen bear out what I have said as to their capabilities. (There follows a list of 12 names of workmen and apprentices who have passed with success the examinations of the workshop.)

*The Fitting Shop.*—This workshop has been organised, and is at present conducted, by the foreman, M. Dessaut, assisted by the head-workman, Shiedecker. The Chinese apprentices and workmen, a list of whom I give to Your Excellency below, have been examined very minutely on the reading of the plans of an engine, and on the working of its component mechanism, taken in their combination or separately. The most advanced have been examined on the means of tracing the various parts of the engine on the tracing table ; an operation which serves to mark out the work to the fitters and to the overseers of the machine-tools ; and on the precautions to be taken when the pieces are placed on a machine-tool.

Finally, questions have been addressed to them as to the starting and working of a marine engine, with the object of ascertaining if they were able to put together the pieces of it, with a full knowledge of the rationale of their use. At the conclusion of that examination I sent to Your Excellency a list of the sections in that workshop, and asked that there should be entrusted to it the setting up of the two engines of 150 H.P., No. 2 and No. 3 of the last design ; the construction of a fourth engine of the same design ; and, finally, the finishing of a fifth engine of the old design, most of the parts of which were already prepared. The Europeans withdrew from the workshop on the 4th August, 1873, and the Chinese workmen have worked alone from the same date, and appear to fulfill the conditions of which I have declared them to be capable. (There follows a list of 34 workmen and apprentices who have passed satisfactorily the workshop examination.)

*The Setting-up.*—This department is conducted by the assistant-foreman Cabouret, assisted by the workman Piron. I have minutely questioned the Chinese staff as to all the designs of an engine and of its boilers. The foreman *Houang-tas* has been specially subjected to a very detailed examination. They have had to reply with reference to the regulating of the position of a machine at the time of its being

set up on board ship and as to the bringing together and the working of each of its component parts.

This test was very necessary; for it is the setters-up who are called on to inspect engines, and to give judgment, at the first glance, as to the repairs they will require. After having submitted to the approbation of Your Excellency the sections of this workshop, I proposed to leave the Chinese workmen to execute alone the setting-up on board of the engines of the ships, Nos. 14 and 15, and I am convinced, from the manner in which their work is being done, that they will carry it through to perfection. (Then follows a list of eight workmen and apprentices who have given satisfaction at the examinations.)

*The Metal-working Forge.*—This forge was organised entirely by the workshop overseer, M. Brossement, and conducted by him until it was handed over to the Chinese workmen, with the assistance of the workman Besancon for the forges, and of the workmen Cerle and Palier for the rolling mills. As the operations of these forges demands a great muscular power, it was impossible all at once to employ apprentices in it; there was no one employed except coolies, at least for the heavy works of the steam-hammer, and of the forges. There was only a single blacksmith there at the commencement; some time afterwards I associated with him some blacksmiths from Ningpo, and four apprentices already initiated in the forges for the fitting-up of ships. In addition to Mr. Brossement's merit in establishing a factory of such importance, he has the no less signal merit of having trained a staff at first completely ignorant of the work of the forges, less intelligent than that of the other workshops, to fabricate the heavy portions of an engine,—a work regarded as difficult even by European workmen. It must also be considered that the factory was completed later than the other workshops; it commenced to work only in the month of October, 1870. The men brought forward as fulfilling the condition of the contract are seven in number. I give the list to Your Excellency further down. As the blacksmiths have to fabricate only a limited number of the portions of engines, I have questioned them less minutely than the rest on the work of an engine in general, in order to dwell thoroughly on the fabrication of the portions which lie within their department. For example, taking each of these portions, I have caused them to sketch them out in their natural size, in such a manner as to assure myself that the foremen and head-workmen might be able to divide and to explain the work to their subordinates; I have caused them to calculate the weight of those pieces, the quantity of pig iron needed, to obtain them out of the forge; I have caused them to sketch a reheating furnace, a forge a steam hammer, in order to assure myself that they would be able to have them repaired in case of need, or to give orders for the necessary repairs from other workshops. Seven workmen and apprentices have answered these questions; the other workmen have been able to read only the outlines of a plan, not having sufficient intelligence to go beyond that. The arrangement of this workshop once accepted by Your Excellency, I caused the European staff to retire, and proposed to cause all the Chinese workmen to fabricate alone the forged portions of two engines of 150 H.P., one of the old design, the other of the new design. That work, begun on the 24th July, is finished, and has been very well done; the two crank-shafts, the most difficult pieces, have both been successful. (Then follows a list of the workmen and apprentices who have given satisfaction at the work-shop examination.)

*The Foundry.*—The head-workmen, Robeson and Rivasseau, are at the present moment in charge, the one of the iron foundry, the other of the brass foundry; the former has as assistant the workman Decachuis. Twenty-one workmen and apprentices for the iron foundry, and five for the brass foundry, fulfil the conditions of the contract. Annexed I send the list of them to Your Excellency. After having carefully examined them on the reading of the plans, and the working of the various parts of an engine, I questioned them as to the practical difficulties of their business. For example, I asked them what mixtures of sand ought to be used according to the nature of the pieces that had to be cast; in what proportion it was necessary to mix casting metals of different qualities, such as new metal with old metal, copper with old bronze, copper with tin and lead; how the patterns ought to be arranged in the moulds for certain difficult pieces; what precautions should be taken in order that the gas might be able to escape from the casting, and under what conditions the casting ought to be made. After this examination had taken place I submitted the arrangements of that workshop to Your Excellency, and I requested that it be handed over to the Chinese workmen, and that they should be set to construct all the pieces of an engine of the new pattern, and the pieces awaiting for engine No. 5, of the old pattern. The workshop was handed over by the European staff on the 3rd September, 1873; and already almost all the pieces of these two engines have been delivered to the Fitting shop; the cylinders, which may be regarded as the most difficult parts, have been cast with complete success. (Then follows a list of 26 workmen and apprentices declared as fulfilling the conditions of the contract.)

*The Boiler Shop.*—The workshop of the Boiler-making department was organised by the foreman Tolmé; but that foreman having left the Arsenal on account of sickness in the month of November 1872, I entrusted this branch to the head-workman Gosselin who still conducts it, and is assisted by the workman Vastel. This workman has presented as fulfilling the conditions of the contract thirty-three workmen and apprentices of the iron boiler shop, and eleven workmen and apprentices of the brass-boiler shop. I have examined them on the plans and working of an engine, dwelling especially on the boilers and the arrangements of the tubing. I have questioned them as to the thickness of the plates of the different parts of the boiler; the method of working those plates and of joining them together, the size of the tubes &c. That first part of the examination ended, three squads composed, two of workmen, the other of apprentices, have been called on to trace in their proper size in the moulding-hall the complete plan of a set of boilers. The tracings have been reviewed and found correct by the engineer, M. E. Juvet, the Chinese officer deputed for the examinations, and myself. The thickness of the plates, the diameter of the tubes, the position of the angle irons and of the cross bearings, were found conformable to the plans. The tracing made by the apprentices was naturally found the more distinct and the better finished. The workshop was handed over to the Chinese workmen on the 9th October, 1873, and organised according to the programme which I have submitted to Your Excellency. It has been worked since then under the orders of their own foremen, without the assistance of the Europeans. There have been commenced two sets of marine boilers, the construction of which proceeds in a satisfactory manner. (There follows a list of 44 workmen and apprentices, who fulfill the conditions of the contract.)

*The Carpentry.*—The Carpentry has been, since the establishment of the Arsenal, organised and directed by the master-carpenter, M. Robin, who has under his orders the foreman Marzin, the head-workmen Péter Raffenu, Latouche, and Guiraud, and the workmen Boulineau and Quénaon. This department is classified into four distinct divisions: the carpentry strictly so called; the boring; the caulking; the workshops for masting and for ships' boats, which comprises also the block-factory and the preparation of rudders and capstans. The carpentry and boring workmen progressed so rapidly in their work that, in the month of August, 1872, I was in a position to request H. E. Hsia, who at that time was Acting Imperial Commissioner, to entrust the construction of the 12th ship to the Chinese foremen *Ho-king-fou*, *Fong-tsing-yong*, *Ou-pen-kong*, *Tchen-si-ti*, and to the foreman borer, *Tchen-tchoun-kae*. On the 19th November of the same year, I, in like manner, proposed to entrust the building of the 13th ship to the foremen *Ling-lang* and *Tcheng-tsing*, and to the foreman borer *Tchen-ho*. These works have been carried on in a manner sufficiently satisfactory to render it unnecessary for the European overseers to take any part in them; except that the ships Nos. 14 and 15 have been later in being put on the stocks. The foreman caulker, *Laé-hou*, also, has alone directed his department in connection with these different ships. Finally, on the 25th Aug., 1873, I was able to hand over to the Chinese workmen the workshop for masting and ships' boats, which has since then been directed, without any assistance from Europeans, by the foreman *Fong-tong*. I have the honour to give below to Your Excellency a list of the Chinese workmen and apprentices who fulfil the conditions of the contract. Among these, I shall specially mention the foremen *Ho-king-fou*, *Fong-tsing-yong*, *Ou-pen-kong*, *Tchen-tchoun-kae*, *Tchen-ho*, and *Fong-tong*. These foremen are not only able to read a plan and execute it, but they are able to trace out a ship in the moulding-hall, and are in course of proving it at present, with the tracing which I have given them to make, and which will soon be finished. If it is taken into account that these men were unable to engage in any preliminary scientific study, the acquisition of such knowledge indicates on their part a zeal and intelligence, and a spirit of observation, worthy of remark.

I have already spoken of the results obtained by the pupils of the School of Naval Construction attached to the Carpentry in the calculation and the tracing out of the ships; the apprentices of this department have likewise made astonishing progress. They have prosecuted the study of carpentering with such success, that, at the end of the Chinese year, they will be far advanced in the practice of tracing in the moulding-hall, and at designers they are already possessed of undoubted ability. I shall shortly send to Your Excellency a very complete album of all the details of the construction and equipments of a ship of the style of the *Yong-pao*, all the pieces in which have been calculated and designed by them. These results do great honour to M. Robin, whose good services are well-known to Your Excellency, and also to M. Marzin, who has been more particularly entrusted with the instruction of the pupils and apprentices. (Then follows a list of forty-three workmen and apprentices fulfilling the conditions of the contract.)

#### FITTING-OUT WORKSHOPS.

The fitting-out workshops are three in number; the cabinet-makers' shop, the equipment forges, and the equipment fitting-shop.

*The Cabinet-makers' Shop.*—The cabinet-makers' shop, to which is attached a machine saw mill, was organised by Mr. Guerin. At the end of June, 1873, I was able to hand over this workshop to the Chinese workmen; the cabinet work of ships Nos. 12 and 13 has already been made by them. The foreman, *Kiang-ta-ta*, and the assistant, *Tcheng-ki*, are perfectly able to read and to execute the plans which are handed to them.

*The Equipment-Forges.*—The workshop of the equipment forges, designed to supply to a ship the thousands of metal fittings which enter into the construction, the masting, and the equipment of a ship, were for a long time under the direction of the foreman Ribière. When that foreman had to leave the Arsenal on account of sickness, I entrusted the workshop to the head-workmen, A. Serreau and C. Serreau. The foremen, workmen, and apprentices, of whom I give below a list to Your Excellency, are able not only to read the plan of it matters not what article of construction or equipment, but to sketch it out in its proper size, in such a way as to explain the work to the workmen placed under their orders. They have throughout worked according to plans handed to them by the Carpenter's Department. (There follows a list of 18 workmen and apprentices who fulfill the conditions of the contract.)

*The fitting on of the Equipment.*—At the beginning of August, 1873, after the departure of the foreman Zeilin, I handed over the fitting on of the equipments to the Chinese foremen.

Since then it has worked as well as previously; the workman Villou has remained in the workshop attached, so as there more closely to superintend the pupils of the schools for apprentices, and to carry on different special works apart from the equipment. (There follows a list of 14 workmen and apprentices of the workshop able to fulfill the conditions of the contract.)

*The Sail-Loft.*—The Sail-loft can now be conducted without assistance, by the Chinese foreman *Leang-yi-tchen*. This important workshop, which also comprises the rigging department, is superintended by Capt. Saunders.

*The Upholstery Work.*—The Upholstery Department has been organized by the head workman Latouche; it can now be conducted without assistance under the direction of the Chinese foreman *Lin-yi*.

*The Workshops of Precision.*—The 18th Article of the detailed executive proposals contains the following paragraph:—"It is necessary that the Chinese workmen should learn to manufacture marine compasses, steam-gauges, barometers, telescopes, &c. The Directors will enquire to what extent it would be necessary to engage European workmen for this purpose, what would be their salary, and the price of the tools they would need to bring with them." It was in obedience to these instructions that the Workshops of Precision were established. At present they are divided into two sections: the *Compass* shop and the *Chronometer* shop.

The *Compass* shop is superintended by the foreman, M. F. Lemarchand. This workshop has supplied to all our ships, except the *Ouan-Nien-Tsing* and the *Mei-Yune*, compasses, opera-glasses, telescopes, barometers, steam-gauges, aximeters, graduated measures, sights for cannon, &c. The workmen whose names follow are able to conduct this

workshop alone, without the assistance of their European foreman; and I accordingly gave this workshop up to them on the 9th of October last.

The *Chronometer* shop is under the direction of the foreman, M. Puthon. This workshop has already manufactured binnacle time pieces, and has supplied several of them to our ships. At present it is employed in the construction of chronometers, which are regarded as very difficult to make. In Europe, there are only a very few workmen who have experience of this kind of work. I hope at the end of this year to be able to submit to Your Excellency several chronometers manufactured by them.

#### ENGLISH SCHOOLS.

It remains for me to report to Your Excellency as to the results obtained by the Arsenal in relation to the instruction intended to train officers capable of navigating ships. The object sought for is thus described in Article 17 of the detailed executive propositions:—"The science of navigation comprehends two stages: the one easy, the other difficult, to master: the first is navigation within sight of land; the second is navigation on the open sea, when the ship remains many days and nights without seeing land. What the Directors guarantee is, that, within five years, they will have taught the pupils in the naval school to navigate in sight of land. As to navigation on the high seas, in which the ship has for her guidance only the compass, the chronometers, calculation, the aspect of the sky and of the sea,—five years cannot be sufficient to learn it."

Thus, the contract stipulated only for instruction in navigation in sight of land, which would have demanded only a knowledge of the use of charts, some limited ideas of Geography and Astronomy, and, finally, the ability to manœuvre ships, which last point can be mastered only by a certain time of residence on board. But the pupils whom Your Excellency entrusted to me have shown themselves so intelligent and so full of zeal, that I have sought to make them not only navigators in sight of land, but navigators on the open sea.

I have already sent to Your Excellency some of those young people able to conduct a ship to it matters not what part of the globe, by directing his course by observations, chronometers, and calculations. The schools of navigation are three in number:—The Naval School; the School of Practical Navigation on board the training ship *Kien-wei*; and the School of Engineers. The studies of these schools have been prosecuted in English, as prescribed by the contract.

*The Naval School.*—The Naval School, or the school of theoretical navigation, has been superintended by Mr. J. Carroll, who is assisted for the moment by M.M. R. Skey and *Lo-fong-lo*. Besides the study of the English language, with which it was necessary to commence, the studies carried on have been arithmetic, geometry, algebra, rectilinear and spherical trigonometry, astronomy, the calculations of navigation, and geography. All these sciences are essential to the navigator. If one finds himself in sight of the coasts, he measures the distance of the points he perceives, whether in regard to his ship, or to the points in relation to each other, by rectilinear trigonometry, the study of which ought to be preceded by that of arithmetic, of geometry, and of algebra. If he guides himself by the sun, the moon, and the stars, he recognises their



position in the sky, and their revolutions by astronomy, and he measures their height above the horizon or their respective distances by spherical trigonometry. The science of navigation teaches him to make use of these helps, of these observations, and of the data of the log, in order to determine the position of his ship; it teaches him to make use of chronometers, which tell him the difference of the hours between the point at which he finds himself and another point well-known, and, consequently, the difference which separates them in longitude. Finally, he cannot possibly traverse the globe without a knowledge of geography.

This programme was carried out in three years and a half by Mr. J. Carroll, and I was able, by a despatch of the 28th of the 3rd month of the 10th year (17th May, 1871), to intimate to Your Excellency that twenty-three pupils had completed their course of studies. Of these, three have not been able to go on board ship on account of their health; one, *Lo-fong-lo*, is now assistant professor; he was the first of the pupils, and he will be able to become professor of the school after the European staff shall have been disbanded. The other, *Le-ta-tchang*, has been employed by me as a translator, and has made sufficient progress in the knowledge of English to enable me to entrust to him the translation of the gun and musketry exercises on board ships of war—a work I will shortly send to Your Excellency. The third, *Huang-hsiin*, is assistant professor at the School of Engineers, and there renders good service. Twenty pupils have gone on board the *Kien-wei*, where they at present are.

After having finished with that division, which was the first in his school, Mr. Carroll took in hand the second division, consisting of nine pupils, who had then forty-three months of study, and who were able to be sent on board the *Kien-wei* on the 3rd September, 1873. There still remains at the school 15 pupils; at the end of the year ten of them will have finished arithmetic, algebra, geometry, and geography. These pupils have had, as yet, only thirty months of study. The last five are still less advanced; they have been at school for only one year, and some of them for only a few months. I need scarcely point out to Your Excellency the zeal and energy which Mr. Carroll has shown in the prosecution of the above. His very feeble health would have demanded of it almost from the commencement to come to a stand-still in his task, but his force of will has been predominant, and has allowed him to fulfill it with a success which I dared not anticipate at the time of the drawing up of the contracts.

*The Training Ship.*—Some of the pupils who are on board the training ship were selected at Hongkong, the others come from Mr. Carroll's school. As the Arsenal remained nearly three years without a training ship, I requested Your Excellency to allow the professor of practical navigation to engage at Hongkong ten young people, intended to form a special school under his own superintendence. The professor was also directed to exercise the pupils of the naval school in the practice of gunnery and of seamanship. He commenced his instruction as soon as the Yamen had given me as a ship of instruction the gunboat *Fou-sing*, which I exchanged in the month of August, 1871, for the sailing ship *Kien-wei*. Your Excellency knows all the difficulties I had in organising that school, and I do not need to repeat them; they were brought to a close only by the arrival of Capt. R. E. Tracey, of the Royal British Navy, who is at present in charge of that ship, and has under his orders the master-gunner, J. Harwood, and the boatswain,

F. Johnson ; the latter, newly engaged, has been at the Arsenal only since the departure of Mr. C. Watton.

In a former despatch, of the 16th July, 1873, I reported to Your Excellency on the progress so rapidly attained by the pupils under the able direction of Mr. Tracey, and I proposed to give to two of them, *Tchang-sheng* and *Lew-han*, the command of ships. Each of these has taken with him a second, *Li-tien* and *Li-kia-pen*, also capable of commanding at sea. It has been easy for me to justify these appointments by showing to Your Excellency the records of observations and the journals kept by the pupils of the *Kien-wei*, and by entrusting to several pupils the command of the manœuvring exercises at the time of the inspection which Your Excellency made on board that ship. It could be judged during that inspection, with what precision, what unity, the pupils and the sailors on board executed the manœuvres as commanded them. An opinion could also be formed of the good discipline of the ship, well calculated to infuse into the young people the regularity and order essential on board every ship-of-war.

During the whole course of the cruise, which was lately finished, and during which the ship had not been less than seventy-five days at sea, Mr. Tracey entrusted to the two pupils, recently appointed captains, the command of the vessel throughout all the manœuvres and anchorages which he had had to make. He follows the same system in the cruise which he prosecutes at the present time in regard to four pupils, whom on his return he will in like manner be able to recommend, two as captains, and two as lieutenants. These pupils are, in the order of enrolment, *Liu-kuo-tsiang*, *Yeh-fuh*, *Teng-she-tchang*, and *Li-ho*. The *Kien-wei* will arrive at Foochow about the middle of December, and will be ready to leave again in the first days of January. At the end of another voyage, Mr. Tracey will be able to recommend, as captains and lieutenants, the six pupils whose names follow :—*Lew-poo-tchan*, *Lin-taë-tseng*, *Tseang-chao-ying*, *Yen-tsong-kuang*, *Ho-sin-chwan*, and *Hwang-kien-hsiun*. We shall then have come to the end of the Chinese year, in other words, to the expiration of the contract which binds us to the Chinese Government.

All the pupils of the *Kien-wei*, except the last nine, who have been on board only since the 3rd September, 1873, will have acquired the theoretical and practical branches of knowledge requisite in the captain of a ship. In order to be made, or even to be recommended, as captains, it would be necessary that they should have, like the first, navigated the training ship during one voyage of a certain length, under the inspection of their instructor. It will be possible, if the service of the training ship should be discontinued after the discharge of the European staff, to distribute them among the steamers belonging to the Arsenal, and to make them continue there the practice of their profession. When the time shall have come to entrust them with ships, they will certainly be found prepared.

As to the last nine pupils, they are also able to be distributed among these ships, and after about two years they should be able to be employed in active service. I give below, to Your Excellency, a list of the pupils of the *Kwei-wei*, with remarks on each of them.

If the Chinese Naval Service were not under the urgent necessity of making use of the services of these young men, it would be possible, with great advantage to them, and to their country, to send a certain number of them to Europe.

After two years of study, some of them might be placed on board foreign men-of-war, where for two years they would act the part of officers, and would assist in that capacity not only in the handling of individual vessels, but also in the combined movements of many ships united into squadrons. They would also become familiarised with different kinds of cannon and firearms, which we have not been able to present for their examination.

As to the *Kien-wei*, if the Arsenal wishes to make use of her after the end of this year, her frame will stand in need of a very thorough overhaul. This ship has, since she has been employed by us, been subjected to several storms, which have severely shaken her, and which render indispensable a careful examination of her hull, and the replacement of every piece of timber and planking which may be found damaged. (There follows a list of the pupils of the *Kien-wei*, with remarks on each of them.)

*School for Engineers.*—The school for engineers has been conducted since its commencement by Mr. W. Allan. The pupils of which it consists have been enrolled by him among those young men who had already worked for some years in the factories organised at Shanghai and Hongkong. They had already acquired there a certain amount of experience in the working of iron and iron-plates, and the effort was to guide them towards the theoretical and practical knowledge of the steam-engine. It was necessary, first of all, to teach them English; thereafter, they prosecuted the study of arithmetic, geometry, design, the description of engines, rules for the management of the engines at sea, the use of the indicator, salinometer, &c. In order to the application of the theories which have been made known to them, they have been employed on practical operations, the principal of which are the following: the setting up ashore of two engines of 150 H. P. and 80 H. P. respectively; the setting up of an engine of 150 H. P. on board the *Wan-Nien-Tsing*; of two engines of 80 H. P., one on board the *Mei-Yune*, the other on board the *Fou-Sing*; of one engine of 80 H. P. on board the *Tchen-hae*, of another on board the *Tsing-yuan*; and of boilers on board the *Hwa-Fon-Paou* and of the *Hae-Tong-Yune*.

Fourteen pupils of Mr. Allan have already been employed on board the ships of the Arsenal for a longer or shorter period. These are: *Lor-yi*, *Li-ah-pun*, *Lin-ho-lin*, *Tchen-king-shang*, *Ho-chao-kwang*, *Li-foo*, *Li-kia-loh*, *Kwo-ching-le*, *Li-ah-wen*, *Chang-yung-tsing*, *Yang-tsin-kwei*, *Pun-chew-sin*, *Fung-jui-kin*, *Cho-kwan-pun*. There still remain in the school six who are qualified for employment, as soon as their services are required; a seventh is too young to admit of his being entrusted with the management of an engine, but he could be made useful as an assistant engineer.

Before the pupils of Mr. Allan are sent on board a ship, they have to undergo a searching examination; the log-book of those who have been shipped is inspected by their instructor each time that their ship returns to Foochow, and the engines which they manage are subjected to a yearly examination, which hitherto has been creditable to them. Mr. Allan has certainly well fulfilled the task that was entrusted to him.

CONCLUSION.

Your Excellency will have been able to see from the preceding statement, what have been the results of the instruction given at the Arsenal by the Foreign staff to the Chinese pupils and workmen.

In that which relates to Naval Construction, they may be summarised as follows :—

*Engines.*—1. Seven young men receiving theoretical instruction from the “superintendents of workshops,” and capable of directing the work of the engines at the Arsenal, if they continue to do the same kind of work as they have hitherto. A pupil capable of being a professor for the succeeding divisions.

2.—Twenty-one young men who are able, by prosecuting their studies, to arrive at the same result in one year, or one year and a half : Of the young men mentioned above, 24 are able to become engineers by continuing their studies.

3.—Twenty-four pupils possessing an important practical knowledge of the design of engines, eight of them being able, by the continuance of their studies, to become “heads of offices of design.”

4.—Eighty-seven apprentices who have attended the schools, possessing an important practical knowledge of their business, and able to work according to a plan given them ; and amongst these, 53 able, if they continue their studies, to rise to be superintendents of workshops, the more intelligent even to be engineers.

5.—One-hundred and eighty-six workmen and apprentices able to work according to a given plan.

*The Building of Hulls and the Equipment of Ships.*—1. Nine pupils able to make an estimate for a wooden ship, to calculate the dimensions of it, and the conditions of its navigability ; to make the plan of its hull and of its sails, to sketch it out in the moulding-hall, and superintend its execution. Of these pupils, 7 are able to become engineers by continuing their studies.

2.—Fourteen apprentices able to design, who have prosecuted with success a course of carpentry, and are able to sketch out a ship in the moulding-hall ; of these, nine are able to become “master-carpenters” by continuing their studies.

3.—Six foremen able to sketch out a ship in the moulding-hall, and to superintend the execution of its hull and of its equipment.

4.—Fifty-eight workmen and apprentices able to work a given plan, whether at the building of hulls or at the work of fitting out.

In these circumstances, the work accomplished for some months by the Chinese workmen alone, has without doubt made Your Excellency clear upon this point : the Arsenal is able to continue, without the help of a European staff, to build ships and engines according to the designs already reproduced.

These designs reach the number of seven for the ships, viz. : the *Wan-Nien-tsing*, *Mei-yung*, *Fou-Po*, *An-Lan*, *Yang-Wou*, *Tchen-Hae*, and *Ying-Pao* designs. For engines there are two designs, which, however, differ from each other only in details, and not in the general principles of their construction.

- As to the teaching of Navigation, the Arsenal has obtained the following results :—

1.—Fourteen officers having the theoretical and practical instruction requisite in order to command a ship of war during a lengthened voyage.

2.—Twelve officers having the same theoretical and practical instruction, but who have not had an opportunity of commanding a vessel under the inspection of a professor of practical navigation.

3.—Nine officers having the theoretical knowledge of navigation, but only an imperfect experience of their profession.

4.—Fifteen pupils at present attending the naval school, of whom nine promise a favourable result.

5.—Three pupils already performing the duties, two of instructors, the other of translator.

6.—Fourteen pupils already employed on board ship as engineers, and seven awaiting their appointment.

I am not called on to express an opinion as to the future which the Chinese Government designs for the Arsenal. We had—my staff and I,—to fulfill a certain mission, which we have exerted ourselves to bring to a satisfactory conclusion ; the month of February, 1874, puts an end to our responsibility. But, with reference to the education given to the pupils and apprentices in the school, I feel it to be a duty to dwell upon the advantages which China would derive by taking measures to continue the education of those whom I have pointed out as likely to yield certain results. Their instruction rests upon solid foundations, it has been perseveringly prosecuted with method and in an earnest spirit ; in a few years they will certainly supply China with engineers and superintendents of departments, capable of carrying out the construction of all styles of ships and engines which she could desire, and with naval officers as experienced as those of any other nation. To leave germs so precious to be scattered to the winds, or to remain without culture, would be to cast away the fruits of seven years' labour, which has cost the teachers, and, above all, the pupils, severe and earnest efforts.

In concluding this lengthened summary, I ought to mention to Your Excellency the coincidence, so valuable for me, which has supplied me with the four of my colleagues more closely associated with me than the others for the accomplishment of the task I had to perform. I desire to speak of the sub-Director, Lieut. L. Dumoyet de Segonzac, of the Secretary of the Directorate, M. A. Borel, and of the two Chinese Secretaries, *Ouang-pao-tchen* and *Lin-tcho-tseng*, whom Your Excellency attached to my immediate service. It is owing to their devotedness that the defections which were at a certain period numerous around the Director, have been stemmed ; and that I have been able to overcome the difficulties which presented themselves, and to subdue the oppositions which have been placed in my way.

It remains for me, finally, to thank Your Excellency ; and my words will, assuredly, not adequately represent the intensity of the gratitude which I feel for the support and the resources that have been afforded us, in order that we should not be stopped in the course that we had to follow. Everything that I have asked from Your Excellency I have

received ; you have watched with incessant anxiety to ensure that the Chinese staff should obey our instructions with the requisite alacrity, encouraging those who deserved it, punishing the idle, and closing your ears to the reports of those who, at the outset, represented the success of the Arsenal as uncertain or brought into question. If the Chinese Government finds that the results obtained have not been such as it expected from our efforts, it can, with justice, impute all the blame to me, for it is impossible to find a co-operation more earnest and more cordial than that which I have met with from Your Excellency, and from the officials placed under your orders.

PROSPER GIQUEL.

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REPORT addressed to HIS MAJESTY the EMPEROR, by HIS EXCELLENCY SHEN, on the 18th day of the 10th month of the 12th year of Tung-che (7th December, 1873.)

I approach with reverence to inform Your Majesty, that the programme of theoretical and practical education, which was to be given to the pupils of the Arsenal, is now completed ; and to beg of you, in Your Lofty Benevolence, to bestow on the European officers and workmen, whose efforts have brought about this result, the rewards I ask for them. I pray you also to decree that the funds required to pay to the said European staff the bonus stipulated in the contract, as well as the expenses of the passage back to Europe of each of its members, may be supplied to me without delay, to be distributed to those concerned, and thus to give evidence of the scrupulous exactness with which we are able to fulfill our engagements, and to render all dispute impossible.

In the 2nd month of the 9th year (March, 1870), I intimated to Your Majesty that, when the construction of marine-engines should be in working order, I would submit to you the names of the European and Chinese employés whose good services might deserve a reward. Your Majesty deigned at that time to grant me permission ; but, meanwhile, I had to go into mourning (for my father), and to give up my position at the Arsenal ; and I was unable thereafter to carry out that proposal.

Beginning with the 6th month of the present year (July, 1873), examinations of ability were undergone by the Chinese workmen and apprentices of each workshop, under the direction of M. P. Giquel, who has been able, according to the indications which have resulted from these, to nominate as foremen the workmen most skilled in their profession, and able to work from given plans, and to associate with them as assistant foremen the workmen who came nearest to them. The European masters having handed over their plans, thereupon withdrew from the workshops, so as to leave the Chinese staff to execute all alone the required works, under the guidance of the said foremen, and under the direction of the pupils of the School of Naval Construction and of Design, apportioned to each workshop. Since then, the work of the Arsenal goes on under these conditions, and the results leave nothing to be desired ;—a fact which shows that the professional education of the Chinese staff has attained the result sought after.

\*After the indispensable preparatory studies of astronomy, geography, and mathematics, the pupils of the School of Navigation have been placed on board the Training Ship,

there to be familiarised with the management of vessels and the dangers of navigation. They have made two lengthened cruises, at the end of which two of them have been qualified to be called on to command ships. There has been opportunity, since then, to feel assured of the knowledge they have of their profession, by the ability and coolness of which they have given evidence during the storms which they have had to endure. More than ten of those pupils are now qualified to take charge of a ship.

The pupils of the School of Engineers have, on their part, accomplished the setting up of several engines which are on board the ships launched from our building yards. Fourteen of them are at present distributed among the several ships, and take charge of their engines. The programme of naval instruction is, therefore, in like manner complete.

If the point at which the Arsenal has arrived be considered, and if account be taken of the difficulties of so new an undertaking, there is ground for thinking that the results already attained promise much for the future. There was room at the outset, to ask whether the Europeans would give up to us so completely the secrets of their sciences and of their industry ; there was room also to fear that the Chinese, little anxious to be instructed in such matters, would bring to their study only limited application and would make but slender progress. This has not turned out to be the case ; and, thanks to the constant support of Your Majesty, the Arsenal has been able to exist and to reach the point at which it now is ; so that there is good ground to expect great services from it in the future. The existing state of things is, doubtless, capable of being perfected and consolidated ; but, with time, we have reason to hope that we shall advance with those who advance, and that we shall run with those who run (to follow Europe) ; and that hope is able, from this time forward, to afford us deep satisfaction.

Those who, from the outset, have assisted to instruct us have a right to the rewards which China, faithful to her traditions, cannot refuse to them. M. P. Giquel has handed to me a list containing the names of the European officers and operatives who have deserved tokens of our satisfaction. I have examined it with attention, and I have observed that it has been drawn up with the most strict impartiality. I place it, as it is, under the glance of Your Majesty, and shall reverentially await your decision.

M. Giquel has originated, directed, and successfully carried through the whole enterprise, with a zeal and an enthusiasm which a thousand difficulties have not discouraged ; he has thus acquired extraordinary claims on our gratitude. M. D'Aiguebelle has had, since the 2nd month of the 9th year (March 1870) a special mission from the Viceroy Tso, and has twice travelled into Kansuh. Notwithstanding, at the time of the origination of the Arsenal, he took a certain share in its inauguration by engaging a portion of the staff and by assisting in the purchase of the materials ; and the services he rendered at that period should not be passed over in silence. I beg Your Majesty to decide what rewards shall be bestowed on these two officials to testify to them Your high satisfaction, and to encourage them, &c., &c.

*A correct Translation,*

G. LEMAIRE.

SHEN, Imperial Commissioner, Director-General of the Arsenal, official of the 1st rank, a Hereditary Noble of the class *Kin-Tche-Tou-Wei*, addresses to M. PROSPER GIQUEL, Director of the Arsenal, the present official communication :—

The Programme of the teaching at the Arsenal being well completed, I, Imperial Commissioner, united with their Excellences

Tso, Viceroy of Shense and Kansuh ;  
 OUEN, Marshal, commander-in-chief at Foochow ;  
 LI, Viceroy of Fokien and Chekiang ;  
 OUANG, Governor of Fokien ;

to beg His Majesty to bestow on you an extraordinary mark of his satisfaction.

The Minister of Foreign Affairs informs me that (directed by the EMPEROR to make a definite proposal with reference to you,) he has requested that the title of an official of the 1st rank be conferred on you, as well as the right to wear the Yellow Jacket and the Decoration of the 1st class, in order thus to testify to you a special goodwill. His Majesty issued on the 18th day of the 11th month of the 12th year the following Edict :—

“ We approve the propositions which have been submitted to us. Respect this.”

I hasten to bring the above to your notice, and I send you the decoration of the first-class.

An important communication to Monsieur Prosper Giquel, Director of the Arsenal.  
 The 16th day of the 12th month of the 12th year of Tung-che (2nd February, 1874.)

*A correct Translation,*

G. LEMAIRE.

In a second despatch of the same date, SHEN states that he and his above-named colleagues at the Arsenal-Board, had asked the following rewards for the other members of the European Staff :—

M. L. DUNOYER DE SEGONZAC, Sub-Director . . . . .	} The title of official of the 3rd rank, and the decoration of the 1st class.
„ R. E. TRACEY, Professor of Practical Navigation. . . . .	
„ JOUVET, Engineer . . . . .	} The title of official of the 4th rank, and the decoration of the 1st class.
„ ZEDEL, Engineer . . . . .	
„ BOREL, Secretary of the Directorate . . . . .	
„ GIQUEL (Jules), Interpreter . . . . .	The title of official of the 4th rank.
„ POUJADE, Physician . . . . .	} The title of official of the 4th rank, and the decoration of the 2nd class.
„ ROUSETT, Professor . . . . .	
„ MEDARD, Professor . . . . .	
„ CARROLL, Professor . . . . .	
„ ALLAN, Professor . . . . .	
„ ROBIN, Master Carpenter . . . . .	} The title of official of the 4th class, and a gold medal.
„ BROUSSEMENT, Chief of the Metal Working Factory . . . . .	



- M. GUERIN, Foreman Pattern-maker . . . . .  
 " DESSAUT, Foreman fitter . . . . .  
 " LOUIS, Superintendent of the offices of Design . . . . .  
 " MARZIN, Foreman Carpenter . . . . .  
 " LE MARCHAND, Foreman of the workshops of precision . . . . .  
 " PUTHON, Foreman of the chronometer-shop . . . . .  
 " PIRY, Professor . . . . .  
 " SKEY, Professor . . . . .  
 " HARWOOD, Chief Gunner . . . . .  
 " SAUNDERS, Foreman Sail-maker . . . . .  
 " CABOURET, Chief Setter-up . . . . .  
 " LATOUCHE, Chief of the Caulking and Upholstery shops . . . . .  
 " SCHEIDECKER, Chief Fitting-turner . . . . .  
 " PETER, Chief Working Carpenter . . . . .  
 " RAFFENEAU, Chief Working Borer . . . . .  
 " GUIRAUD, Operative Carpenter . . . . .  
 " QUENON, Operative Carpenter . . . . .  
 " BOULINEAU, Operative Carpenter . . . . .  
 " ROBESON, Chief Working Moulder . . . . .  
 " DECAUCHIS, Chief Working Moulder . . . . .  
 " PAILLER, Operative Moulder . . . . .  
 " CERLE, Operative Plate Roller . . . . .  
 " BESANCON, Operative Blacksmith . . . . .  
 " PIRON, Operative Fitter . . . . .  
 " RABILLER, Operative Locksmith . . . . .  
 " A. SERREAU, Chief Working Blacksmith . . . . .  
 " C. SERREAU, Chief Working Blacksmith . . . . .  
 " VIDLOU, Operative Fitter . . . . .  
 " MULLER, Chief Working Pattern-maker . . . . .  
 " PONS, Operative Pattern-maker . . . . .  
 " GOSSELIN, Chief Working Boiler-maker . . . . .  
 " VASTEL, Operative Moulder and drawer . . . . .  
 " KERDRAON, Operative boiler-maker . . . . .  
 " REY, Storekeeper . . . . .  
 " ESTIENNE, Clerk . . . . .  
 " BELOIN, Overseer . . . . .  
 " ROBERDEAU, Professor . . . . .

The title of official of the 5th rank,  
and a gold medal.

The title of official of the 6th rank,  
and a silver medal.

The Minister of Foreign Affairs informs me that His Majesty, on the 18th day of the 11th month of the 12th year, issued an Edict of the following purport:—

"We approve the propositions which have been submitted to us. Respect this."

I transmit to you herewith the decorations and the medals, and beg you will hand them to those for whom they are intended.

The 16th day of the 12th month of the 12th year of Tungchi (2nd Feb., 1874.)

*A correct Translation,*

G. LEMAIRE.







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